OXFORD JOURNALS

OXFORD UNIVERSITY PRESS

Design History Society

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Design, Ecology, Technology:
A Historiographical Review

This article provides an introduction to this special issue of the journal on eco-design, and explores the various dimensions of the subject through a wide-ranging historiographical review of the literature on design and the environment.[1]

Introduction

The 'environmental perspective' is deeply embedded in the social and political fabric of our existence. It has become a penetrating and pervasive feature of our daily lives, influencing our judgements, our moral positions, our systems of belief, and our everyday conduct. But, as with all fundamental social issues, the environmental perspective offers neither reconciliation nor peaceful resolution, but rather a set of tantalising contradictions or divergent patterns of belief and action which constantly defy solutions yet persistently invite a striving for mediation.[2]

This was written in 1976, at the height of the first great wave of environmentalism which emerged as a distinct social, political—and design—movement for the first time in the late 1960s and early 1970s. More recently the same author, Tim O'Riordan, has referred to 'sustainable development' as the latest of a long series of attempts by environmentalists to attain 'an equilibrium not of this world'.[3] Popularized by the Brundtland Report of 1987,[4] 'sustainability' has become the buzz word of the second wave of environmentalism of the 1980s and 1990s which produced the phenomenon of 'green design'. Although the recent spate of publications on 'green design'[5] tend to view the greening of design as a relatively straightforward process of applying certain environmental principles to the practice of designing products for industry, 'sustainable development' poses fundamental and uncomfortable challenges to the design *status quo* as it does to other professions and disciplines. In the Brundtland Report the concepts of 'equity', 'participation', and 'futurity' are essential components of 'sustainability' and the report refers to the overriding priority of satisfying the essential needs of the world's poor, and accept-

ing limitations imposed by technology and social organization on the ability of the environment to meet present and future needs, in all countries. The central, and most widely quoted, of the report's concepts is concerned with 'futurity':

Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.[6]

Such criteria within the environment and development movement introduce into the debate over design, industry,and ecology a whole range of issues that have been discussed in the ecological literature for at least three decades. Because this literature is by its very nature 'holistic', a study of design and ecology requires an inter- or multidisciplinary approach. Relevant material can be found in a wide range of subject areas including: ecology and environmental science; environmental economics; environmental politics; policy-making and environmental law; cultural geography and environmental planning; appropriate technology and development studies; design management, technology, and innovation; not to mention publications on design and design history.

As well as presenting difficulties because of its range and volume, much of the ecological literature is problematic because of its inherently polemical nature. Throughout its history environmentalism has been, if not overtly political, at least oppositional, and key texts are usually part of a continuing debate. It is this which makes a historical perspective particularly necessary because it can help to clarify the confusing range of current ideas and issues and explain their origins and thus begin to offer a critique of today's conventional wisdom. Changes in terminology, for example, can sometimes indicate changing values and priorities, although they can also disguise continuities. In the design field the change from 'alternative design' and 'design for need'—the catch-phrases of the 1970s—to 'eco-design', 'green design', or 'environmentally affirmative design' in

the 1980s and 1990s reveals an underlying shift in social and political attitudes.

The study of design and ecology over the last twenty-five years can therefore help to contextualize current practice, and ecologically based research into the history of design in this and earlier periods can provide a new perspective on the nature of design in pre-industrial and industrial societies, and lead to the reassessment of familiar material. This review is not intended as a definitive introduction to such a history of ecological design but as a preliminary guide to the source material and literature in the relevant areas of design, ecology, and technology. I have concentrated on the last twenty to thirty years as the most important, and accessible, period although many of the publications cited extend the debate further back in time. Most of the publications referred to are British or American and this bias is partly because of availability but also because these two countries were the pioneeers of environmentalism and therefore of design and ecology, and much of the ecological literature is written in English. The exception to this is Germany which not only played a crucial role in the emergence of the environmental movement in the late nineteenth and early twentieth centuries but has been in the vanguard of the green movement and ecological design in the last decade or so. It is not possible to review the German literature here except to refer to some useful recent general publications.[7] It is probably inevitable that since much of what I say, particularly about the recent past, is informed by direct experience there is a bias towards the British context. This is not to deny the increasingly global nature of environmentalism and ecological design.[8]

Green Ideas and Issues: A Guide to the Ecological Literature

It is impossible to approach the subject of design and the environment without delving into the ecological literature, because not only is there a paucity of material on ecological design but ecological design cannot be divorced from ecologism.[9] However, the general literature on ecology and environmentalism is so enormous[10] that it is difficult to know where to start and how to evaluate the different kinds of material available. What follows is a highly selective discussion of some general books which are particu-

larly useful as background reading for design issues and history because they summarize a wide range of material, reprint key texts and on occasion include extensive bibliographies.

As well as many popular guides on 'how to be green' the recent wave of public environmental concern has seen the publication of numerous dictionaries and reference books in response to the general demand for more information. There are many dictionaries of the environment which explain important environmental problems such as global warming or ozone depletion, but one of the most interesting from a design point of view is the *Gaia Atlas of Planet Management*.[11] This is a comprehensive treatment of the current environmental crisis from both a scientific and cultural perspective, covering land, ocean, and the elements, but also health, population, industry, and technology. It therefore provides background material on design-related issues and the layout of the book itself is also interesting from a design point of view. It is an example of the 'mental maps' which Gaia Books, who 'package' rather than publish books, have specialized in. They are particularly concerned with integrating illustrations, photographs, and text to express complex ideas visually and, according to Patrick Nugent, the designer, this represents a new process of 'inner design' in which a graphic designer is fully involved in developing the concept and design of a book as a whole rather than being brought in at the final stage to add style.[12]

Another invaluable reference book is *A Dictionary of Green Ideas* by John Button.[13] Having been active in the green movement in the 1970s and 1980s, Button draws on his extensive knowledge of the issues and ideas within and on the fringes of the movement to date and define the huge range of words and concepts which constitute 'a green view of the world'. The selection is deliberately eclectic and non-prescriptive and maps a 'landscape of distinct but intimately linked green fields'—Button was trained as a geographer. It includes ecology, conservation, peace studies, feminism, alternative education, complementary medicine, appropriate and alternative technology, and the entries amount to a (recent) history of ideas because for each entry Button gives the first known use of the term and then looks at its changing use with particular reference to publications. The list of sources for definitions and quota-

tions included at the end of the book provides a good guide to the ecological literature since the 1960s. The entry on 'Ecology', for example, looks at the original scientific meaning of the term and then at its adoption as a more general cultural term, particularly in a spate of publications from the 1970s called *The Ecology of . . .*[14] There is also a long list of about ninety sighted uses of the prefix 'eco' to refer to anything vaguely to do with environmental issues.[15] The dictionary is a good source book for green clichés like 'As If . . . Mattered', which since E. F. Schumacher's *Small is Beautiful: A Study of Economics as if People Mattered* is in danger of being overworked.[16] The entry on design is a radical definition of green design—what would now be called 'dark green'—linked as it is with appropriate technology and socially useful products:

The envisioning of structures, networks and facilities for the benefit of human beings. 'The planning and patterning of any act towards a desired, foreseeable end constitutes a design process' (Victor Papanek, 1974). The problem with much design is that it has inappropriate goals, usually financial ones. Green design—'design for the real world' (Papanek's phrase)—is intimately linked with appropriate technology and 'design with nature' (the title of a book by Ian McHarg (1971)).[17]

What this means in practice can be seen in *Green Pages*[18] compiled by John Button where the section on 'Home' includes self-build housing, recycled tools, household equipment, ecological furniture, and recycled materials. *Green Pages* is a 'Directory of Natural Products, Services and Ideas'—a kind of latter-day *Whole Earth Catalog*[19]—and as such is chiefly useful for contacts and addresses, but there are also detailed references to publications and organizations which are an excellent introduction to green issues and ideas.[20]

Anthologies are another way of finding a way through the maze of publications on environmentalism. Michael Allaby's *Thinking Green: An Anthology of Essential Ecological Writing*[21] contains extracts from the key texts of the environmental movement from the first works on agriculture in the early 1960s, through the debates over population and economic growth, pollution, steady-state economics, nuclear power, and the political and social consequences of industrial society of the 1970s, to the new ideas emerging in the 1980s, such as James Lovelock's Gaia hypothesis. Each text is preceded by a short

introduction which puts it in context and this includes historical context because alongside more recent writings there are extracts from John Evelyn (on pollution in London in the seventeenth century), William Morris's *News From Nowhere*,[22] J. S. Mill (on the stationary state), and Malthus (on population). A more recent anthology, *The Green Reader*,[23] covers much the same ground but from a political science perspective. The extracts are thematic rather than chronological and come from classic historical texts such as *The Limits to Growth*, *The Tragedy of the Commons*, and *Small is Beautiful* which are reprinted alongside more recent material. It is divided into subcategories: 'The Green Critique', 'The Green Society', 'The Green Economy', 'Green Political Strategies', and the short introductions to each piece create 'an informal story by indicating the importance of each extract to Green politics as a whole'. This makes the book an excellent introduction to current issues relevant to ecological design: the Third World and development; green consumerism; energy; economic growth; sustainable development; deep ecology.

These anthologies provide the source material with which to create a history of environmentalism but despite the steady stream of publications from the 1960s there has been very little actual history of ecology, although ecological publications usually make implicit assumptions about the historical roots of the current environmental crisis. Opinions differ about this, as they do about the precise origins of the modern environmental movement, but it is becoming evident that damage to the environment certainly did not begin with the Industrial Revolution of the eighteenth century and even predates the scientific renaissance of the fifteenth/sixteenth centuries which many green writers identify with the emergence of a mechanistic and anti-ecologial world view.[24] Clive Ponting's *A Green History of the World*[25] is the first book to explore fully the relationship between human history and the operation of ecosystems and to view current environmental issues in the light of the past, including the far distant past since the book covers about two million years of human history. Ponting argues that, while environmental problems are nothing new, it is the scale and complexity that have vastly increased and shows how an ecological perspective challenges accepted notions of historical and technical progress. The

book covers hunters and gatherers; early human settlements; the creation of the Third World; the two great transitions, firstly the birth of agriculture, secondly the move from wood to non-renewable fossil fuels; and the creation of the affluent society. There is much here which suggests the possibility of parallel studies in design history and of a similar work of reinterpretation, drawing upon existing studies by historians, anthropologists, economists, not written from a 'green' perspective but providing evidence of the use of resources and energy, the creation of poverty and wealth, and the way people think about the world they inhabit. A similar period is covered in I. G. Simmons' *Changing the Face of the Earth: Culture, Environment and History*[26] although this book, written by a geographer, is more strictly ecological in approach and there is more detailed, scientific analysis of the energy use and environmental impact of humankind from hunters and gatherers to modern industrial society.

Anna Bramwell's *Ecology in the 20th Century: A History*,[27] despite its title, is not so much a study of the science of ecology, but rather an intellectual history. Although she discusses Ernst Haeckel's early scientific use of the term 'ecology' in the mid-nineteenth century she also emphasizes the social and political ramifications of his ecological view of society which were very influential at the time. Her book is really about this kind of ecologism: ecology as a system of thought and its political affiliations. Because of her extensive research into Germany she is the first fully to acknowledge the uncomfortable fact that ecology in the early twentieth century was closer to the political right than to the left and that the National Socialist Party can be viewed as the first 'green party',[28] although she dismisses the idea that there is an inevitable connection between fascism and ecology. This political affiliation of some ecologists in the inter-war period might help to explain why the Modern Movement in its heroic phase appeared to be 'ecologically philistine',[29] opposing the ecological values of the rural, local, and natural in favour of the urban, international, and industrial. But Bramwell shows just how complex the situation really was because German modernism was not only heavily influenced by Rudolf Steiner but ecologism and modernism can also be seen to be closely intertwined in the work of urban theorists like Patrick Geddes and Lewis Mumford.[30] This is an area

explored by David Matless in his article on Patrick Abercrombie in this issue. The decentralist, back-to-the-land movement we might now associate with the environmental movement (particularly in the 1970s) therefore has a precedent in the early twentieth, as well as the nineteenth, century. The contemporary identification of ecologism with the left is because of its re-emergence as a radical alternative movement in the 1960s, as Bramwell shows.

Many authors see this period as the real starting point for a history of environmentalism, because this is the period when it emerged as a clearly identifiable political and social movement for the first time. John McCormick's *The Global Environmental Movement: Reclaiming Paradise*[31] is the first full history of environmentalism as a global social, economic, and political phenomenon. It is largely an institutional and political history but also includes material on the nineteenth-century origins of the conservation and environment movement, and analyses in detail some of the key debates of the 1960s and 1970s, in both More Developed Countries (MDCs) and Less Developed Countries (LDCs). The growth/non-growth debate and the first UN conference 'Only One Earth' in 1972 give the context for the first wave of alternative technology and 'design for need' of the 1970s. The analysis of changes in the environmental movement from the 1970s to the 1980s helps to explain some parallel developments in design too. For example, studies of the 'issue-attention cycle', the life cycle of a social issue, which have been applied to the rise and fall of environmentalism in the 1970s[32] immediately suggest parallels in design and alternative technology. The summary of changes within the green movement and the new concept of 'sustainable development' in the 1980s[33] also help to explain the emergence of 'green design' and 'green consumerism'. McCormick explicitly discusses the political context of these in a more recent book *British Politics and the Environment*[34] in a chapter on 'The New Green Society'. This book is also a good introduction to the general areas of environmental legislation and policy-making, the European Community's Environmental Policy, and Thatcherism and the environment, which are essential to the understanding of design and the environment in Britain in the 1980s.

The area of environmental policy is central to recent discussion of eco-design and there is an

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extensive specialized literature on the subject. Despite its date O'Riordan's *Environmentalism* is still one of the best general introductions to this subject, particularly because his approach is so open-minded. The book is intended as a 'participatory document for the active minded' outlining the 'differing ideological perspective on various environmental matters', and revealing 'divergent patterns of thought'.[35] It is an appraisal of the different ideologies of environmentalism, designated as 'ecocentric' and 'technocentric', as applied in the fields of population and resource consumption, the measurement of environmental quality, environmental cognition, and environmental law. These are all now key issues in recent research on design and the environment which are primarily concerned with environmental policy and protection, although they were not so widely discussed in the design literature of the 1970s when O'Riordan wrote this book. *Environmentalism* was published as part of a series of books on planning and this explains its definition of environmental design as the 'practical application of environmental philosophies'.[36] This emphasis on the design process as practical policy, and on design decision-making, has obvious parallels in the design methods movement and is related to the design policy studies of the 1980s which have more recently become explicitly concerned with environmental matters. One example from the book will show how a study in another subject area can shed light on design matters. O'Riordan refers to the economic debate over the need to consider negative externalities, such as environmental impact, or 'bads', as integral to the economic production of goods and services as well as products or 'goods'.[37] Thus an ecological history of design would have to consider the 'World of Bads' as well as the 'World of Goods'.[38]

Elsewhere in the book O'Riordan looks at environmental perception and cognition and the way it affects, for example, consumer purchases; and at attempts to limit product obsolescence and encourage product recycling. These issues not only have obvious relevance for design history, but because they refer to work done in the 1970s they are already history. The overall usefulness of *Environmentalism* is that it refers both to writers like Schumacher and others within the environmental movement as well as more mainstream research in economics and environmental management, and this makes the extensive bibliography particularly valuable. O'Riordan ends the 2nd edition of the book with a sympathetic assessment of the emerging alternative, informal sector of small-scale, socially constructive enterprises which in 1981 were still only tiny experiments but which he hoped would begin to expand into the mainstream.[39] Whether this really happened in the 1980s or not is a matter of debate but it is clear that the early 1980s were a turning point when the first wave of environmentalism and alternative design was undergoing a transformation.

Design and Ecology: from Design for Need to Green Design

The ecological design movement which emerged in the 1970s can be said to consist of several interconnected strands: voices of dissent from within the design profession—most notably Victor Papanek and Gui Bonsiepe; the Appropriate Technology movement associated with E. F. Schumacher and the Intermediate Technology Development Group (ITDG); and Alternative or Radical Technology which developed out of the counter-culture movement of the 1960s.

Victor Papanek is the most well-known designer working in this area and his first book *Design for the Real World*[40] is the most famous, not to say infamous, book on the subject—it is the one book on environmental-related issues that most designers have heard of and, conversely, the one design book that most environmentalists have read. It was first published in Sweden under the title *Miljon och Miljonera*[41] and then only published in America after twelve publishers turned it down.[42] Like many influential and controversial books, such as the contemporary *Small is Beautiful*, on re-reading, the context of *Design for the Real World* seems a little at odds with its reputation. Although it has long been considered the one book which looks at the environment and the Third World from a design point of view, the subject matter is much wider than that and it is in fact much more about design in the 'first' world and about consumerism than what would now be considered key environmental issues. This is not to deny the fact that Papanek was the first designer to discuss ecology and environmental issues which are covered in the chapters on 'Bionics: The Use of

Biological Prototypes in the Design of Man-Made Systems' and 'Conspicuous Consumption: Design and Environment' as well as elsewhere in the book. There are also many references to design and appropriate technology in the Third World but the book is not centrally about design in developing countries. Its essential message is to do with the social responsibility of the designer and the role of the industrial design profession in the creation of forced obsolescence and the design of socially irresponsible products. In this respect Papanek was writing in the American tradition of Vance Packard whose book *The Waste Makers* was an attack on the profligacy of the consumer culture emerging in the USA in the middle years of the century.[43] Papanek paid tribute to Packard and extended his critique to an attack on the industrial design profession whose history he described as 'Phylogenocide'. It was this uncompromising attack on the design profession which aroused the hostility of many designers in America and elsewhere at the time. In the USA the book was quite well received outside the profession but tended to be dismissed as either a diatribe or naïve by designers, and when the English edition was published in 1972 it was equally controversial.[44] But it was precisely the strong moral tone and the rejection of the values of a consumer society that made the book very influential on young designers and design students at the time. The initial impact may have got lost as the book became a classic in the 1980s, and the design climate changed, but the reawakening of interest in both ecological design and ethical consumerism in recent years means that the book has come in for something of a revival.[45]

Papanek followed up the themes and issues raised in *Design for the Real World* in articles and books published in the 1970s. He continued to collect examples of idiot-gadgets and socially useless objects[46] and to develop alternatives such as kit designs, shared ownership of specially designed consumer goods, examples of reuse and repair, advice on how not to consume, and design using recycling and remanufacture,[47] all of which anticipate the recent concerns of green design. In the 1980s Papanek's views began to change. On the one hand he began to question the role of Western designers in developing countries and now says:

Although I am still interested in Design coming from the Third World, I feel very strongly that designers and archi-

tects who are living in the Third World are by now able to successfully do their own design for their own needs as well as for export to other countries and that designers from developing countries can also see problems in a developing country other than their own more clearly than imported 'experts'.[48]

This does not mean that Western designers do not have a great deal to learn from the indigenous objects created in other cultures[49] or that design should not be seen in a global economic and environmental context. Papanek has become increasingly concerned with ecology, ethology, and the environment and *Design for Human Scale* of 1983[50] was more specifically concerned with the interaction between ecology and design and drew upon the work of Schumacher and the alternative technology movement. Although it was not so controversial as *Design for the Real World*, this book deserves to be much more widely read. More recently Papanek has become increasingly interested in what he calls the 'Forensics of Architecture', that is eco-architecture and building biology, and the close connections between ecological and spiritual awareness. This is the subject of a forthcoming book called *The Green Imperative: Towards the Spiritual in Architecture and Design*.[51]

Gui Bonsiepe is the only other designer to have been particularly concerned with the social and environmental impact of design although he has approached the subject from a different perspective, having come from a different background and tradition than Papanek. German-born, Bonsiepe was a student and then a tutor at the Hoschule für Gestaltung, Ulm, and a disciple of Tomás Maldonado. He remained there until the closure of the school in 1968 and then went to work in Chile in the Allende government on a technical assistance project, later joining the INTEC (Institute of Technical Research) Product Development Group. He has continued to work in Latin America, having moved to Brazil in 1981, and has developed a theory of industrial design in 'peripheral', as opposed to 'central' economies, informed by neo-Marxist theory and the dependency literature of Latin American sociologists. Bonsiepe has been primarily concerned with the issues of design and development, and the social relevance and the socioeconomic context of industrial design. In papers given at the 1976 and 1979 International Council of

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Societies of Industrial Design (ICSID) conferences,[52] he put great emphasis on the political context of design in the 'periphery' and argued that what needed was not design *for* developing countries but design *in* and *by* developing countries. There were two designs, he said, design in and for central countries and design in and for peripheral countries and it was not certain that the right kind of infrastructure yet existed for developing design in the latter. Bonsiepe has recently published articles in English on this subject[53] but despite his involvement in this area for about twenty-five years, working for the United Nations Industrial Development Organisation (UNIDO) and ICSID he is still relatively unknown in design circles. This is partly because his main publications since the late 1970s have been in Spanish and Portuguese,[54] but Bonsiepe's approach has also remained marginal in the design literature because the issue of design in developing countries has increasingly been seen as a political, rather than design, issue and associated with the political left.[55] He now sees the 1970s movement as having made a valuable contribution but having had limited effect:

I consider it a merit of the representatives of the appropriate technology movement to have asked some uneasy questions about industrialization and its effect on the Third World; furthermore, of having shifted attention to the rural (poor) population . . . In the seventies, there still was the hope that a different social organization would give rise to different products and a different mode of consumption. This hope has today been shattered.[56]

'Design for Need' 'touched a nerve of concern' in the 1970s but since then, for political reasons, the discussion has become silent, although he feels that some of the issues are appearing again under the guise of 'Sustainable development'. Bonsiepe was never so directly concerned with environmental or ecological issues as Papanek, although they did appear in his writings in the 1970s, but he has recently written about ecological design in the development context in an article entitled 'North/South Environment/Design'. This deserves to be widely read because it is unique in the design literature in discussing ecological design in a totally global context. The emergence of a new environment ethic implies a new design ethic:

The unquestionable merit of eco-design consists in having articulated concerns which put into question paradigms of design and industrial production and consumption that we took for granted.[57]

But the great danger is that this will not be applied to the 'peripheral' countries who will shoulder the costs of environmental standards but not their benefits.

There are some signs that the issue of environment and development is being drawn into the design debate. In a recent review of the literature on industrial design in developing countries, Alpay Er and Langrish relate the paucity of literature to 'the general trend which defines design only in the specific cultural, social, economic, and political contexts of the industrialised market economies', although the situation has begun to change as design is discussed in the context of the industrializing LDCs or NICs. Their paper is confined to this area but they acknowledge the continuing relevance of appropriate technology for some issues of industrial design in LDCs. They end their report on design and developing countries with the following comment:

the 90s may witness some important conflicts for NICs e.g. the reality of the global division of labour versus the aspirations of local groups or economies of scale versus competition through diversity, and so on. The outcome of these conflicts will determine the future development of industrial design in the Third World.[58]

This raises the whole issue of the relationship between design and the Appropriate Technology (AT) movement in the last twenty to thirty years. While it is true to say that the Third World has largely been marginalized within the design debate, especially since the 1980s, it is also the case that design has been largely ignored in the development debate too. In the huge quantity of literature on Appropriate Technology published since the 1960s there is scarcely any direct reference to design, even though there are many cases where the failure of a product can be ascribed to the lack of design considerations. For example, many projects for fuel-efficient stoves in the last decade or so have tended to treat design as a technical problem and have failed to take user needs and ergonomic, social, and aesthetic factors fully into account.[59] This is partly a problem of definition: of identifying the precise dividing line between design and engineering; of defining the role of the designer in pre-industrial as opposed to industrial contexts; and deciding whether design is an activity confined to professional designers or is

an everyday act by everybody. This was one of the contentious issues raised by Papanek in *Design for the Real World* where he defined design in extremely general terms and is probably one of the reasons why he was so fiercely attacked by professional designers.[60] In fact, whether design is defined as primarily object-based or whether it is seen as a problem-solving activity related to the provision of everyday needs, much of the AT literature is clearly about design. The first Intermediate Technology publications in the 1960s were catalogues of relatively low-cost human or animal-powered machines produced by 'hole in the corner' firms in England at the time.[61] These socially useful appropriate engineering products were early examples of what later became known as 'Design for Need'. AT publications continued to concentrate on the provision of products for different categories of need when 'Design for Need' went out of fashion among designers in the 1980s. For example, a recent publication by Gordon Hathaway, *Low-Cost Vehicles: Options for Moving People and Goods*,[62] is a visual catalogue of different categories of transport from carrying aids, wheelbarrows, and animal transport to pedal-driven vehicles and bicycle and motor-cycle trailers and includes a brief definition and history of each category of transport as well as design details. Because Hathaway is concerned with developing countries the term transport is interpreted more widely than usual in industrialized nations, where it is synonymous with cars, trains, and aircraft. Interestingly this is precisely the point now being made by transport campaigners and environmentalists in MDCs who argue that walking and cycling are transport too and must be considered in transport planning. This kind of technology transfer in reverse occurred in the 1970s when the Alternative Technology movement frequently adopted ideas originally intended for developing countries but which seemed relevant in Europe or America. For example, Jon Vogler's book *Work from Waste: Recycling Wastes to Create Employment* was intended to improve the lot of the thousands of poor people in LDCs who live by collecting and processing waste, but the author acknowledged that 'it may also be of interest in industrialized countries, for communities and groups practising local self-reliance'.[63] Since design using recycled materials has recently come to be seen as important by designers and industrialists in MDCs

as well as LDCs, a handbook like this is still extremely useful. But the question of self-reliance and the nature and scale of industrial development is as contentious an issue now as it was in the 1950s and 1960s when E. F. Schumacher first began to write about it.

Schumacher was the inspiration behind the Appropriate Technology movement. He was by training an economist, and his most influential book *Small is Beautiful*[64] expressed his profound concern over the consequences of modern economic development and the materialist way of life it has created, in both industrialized and developing countries. What he wrote has many implications for design. The chapter on 'Buddhist Economics', his most reprinted text, for example, provided a model of an alternative, non-violent, sustainable economy which appealed to a generation reacting against Western consumer society in the 1960s and 1970s, and suggests an alternative, ecological approach to design too. An economic system based on Buddhist principles would not, he suggested, be concerned with the maximization of production but sufficiency for everyone's needs, with 'the maximum of well-being with the minimum of consumption'.[65] There would be no place for a technology which mechanized production to increase the quantity of goods but at the same time destroyed the environment[66] and the human value of work. Schumacher followed up these ideas in a series of lectures later published as *Good Work*.[67] This has Morrisian overtones although Schumacher seems to have been more influenced by the writings of Gandhi, Coomaraswamy, and the Sarvodaya community development movement in India than by his nineteenth-century English predecessors. Schumacher adapted Gandhi's ideas of industry and technology to modern needs in the post-war period through the concept of intermediate technology. This was intended as a vast improvement for developing countries, on the primitive technology of the past, but at the same time simpler, cheaper, and less violent than the 'super-technology' of the rich.[68] In 1965 Schumacher and others founded ITDG in order to adapt available technologies to the needs and resources of the poor through the development of appropriate tools and equipment. Appropriate Technology quickly replaced Intermediate Technology as a more neutral and

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acceptable term and Schumacher later referred to it as 'human-scale technology': simple, democratic, and participatory.[69] As the article by George Day and Simon Croxton on ITDG in this issue shows, the situation proved to be much more complex than Schumacher imagined; what was appropriate in any particular context was open to dispute and participation in development projects often proved to be more imaginary than real.

These questions are fully discussed in the extensive literature on the AT movement. *The AT Reader* edited by Marilyn Carr[70] is perhaps the best introduction to the theory and practice of Appropriate Technology because it contains selected texts on the definition, history, criticism, and development of AT—ranging from Schumacher and Gandhi to more recent writings—as well as looking at key areas of practice: agriculture, health, energy, housing, transport, manufacturing and recycling, and education. P. D. Dunn's *Appropriate Technology: Technology with a Human Face*[71] is a basic practical guide to the movement with many useful examples. Willoughby's *Technology Choice: A Critique of the Appropriate Technology Movement*[72] is concerned with theory, with the full range of concepts and debates over AT since its inception twenty-five years ago. He includes chapters on 'AT in the North' as well as 'AT in the South' and this indicates a change of emphasis which had occurred in the movement in the 1970s. What had originally been intended by Schumacher as a solution mainly for the developing countries was increasingly seen as relevant in the industrialized countries too and the concept of an alternative or radical technology, which was ecologically sound, non-polluting, small-scale, and decentralist, developed into a substantial movement in the 1970s. This was reflected in two books written on AT around 1980, when the term 'AT' was rather confusingly often used to refer to both Appropriate and Alternative Technology. Schumacher had intended to write *Small is Possible* as a sequel to *Small is Beautiful* but after his sudden death in 1977 it was written by his close friend and colleague George McRobie instead. Intended as a round-up of the achievements of the AT movement, it in fact devotes as much space to the alternatives movement in the 'rich' countries, Britain, the USA and Canada, as to AT in developing countries.[73] Similarly, *Paper Heroes: A Review of Appropriate Technology*, a scathing attack on the

movement by Witold Rybcyznski, used the term AT to refer both to Schumacher and technology in the Third World, and to the alternative movement in Britain and America which had its origins in the youth culture of the 1960s.[74] By the early 1970s there were many examples in theory and practice of this 'radical', 'community', or 'soft' technology[75] which represented a rejection of post-war industrial society and enshrined a whole set of alternative values. These were perhaps best expressed in the writings of Ivan Illich who referred to the way in which industrial tools had created a lifeless, alienating, passive existence. By contrast a 'modern society of responsibly limited tools' would have the opposite effect, leading to self-reliance, respect for the environment and convivial forms of social life'.[76] Publications like *The Whole Earth Catalog* were intended to provide access to such tools—which did not literally mean tools as in the early ITDG publications but included anything from books to equipment as long as it was relevant to independent education, was high quality or low cost, and was easily available by mail.[77] There were many examples of what constituted an 'alternative design', how to reuse, remake, and do with less, products based on low-impact technology and renewable energy. These were covered in *Radical Technology*, an equivalent source book published in England by the editors of the alternative technology magazine *Undercurrents*. This was not a catalogue but a detailed analysis of

technologies that could help create a less oppressive and more fulfilling society. It argues for the growth of small-scale techniques suitable for use by individuals and communities, in a wider social context of humanised production under workers' and consumers' control.[78]

It therefore covered all the areas of basic need: food, energy, shelter, materials, and communications from the point of view of self-build and do-it-yourself technology, and there are many design-related articles: on folk building, self-build, working with wood and metal, recycling materials, and transport issues. These are set within a political context, particularly in the annotated bibliography and directory by Peter Harper which, though now outdated, is still an excellent guide to the existing literature at the time, and in his section on 'Autonomy' which is a social and economic analysis of the possibilities of self-sufficiency. This section was

incorporated into the Open University set book for the Control of Technology course and similar material was covered in the course on Man-made Futures: Design and Technology.[79]

The one book that covers all these different areas—appropriate or alternative technology, design for the developing world, and design for the 'real world'—is *Design for Need: The Social Contribution of Design*. This is a collection of papers from a conference organized by ICSID and held at the Royal College of Art in 1976. It brought together speakers from all over the world: the designers Papanek and Bonsiepe, architects Alexander Pike and Robert and Brenda Vale, people from Oxfam and Friends of the Earth (FOE), and many representatives from the alternative technology movement. The aim of the conference was the 'systematic study and development of design applied to projects of social value', in the areas of resources, environment, aid, and development.[80] But what the conference made clear was that these were not simple issues and there were divisions between those who seemed to think that an ethical approach to technology or design could change society and those who, like Thomas Kuby, felt that instead 'Social Forces Determine the Shape of Technology'. The title 'Design for Need' caused some problems too. To some it meant a straightforward concern with those neglected areas of social need identified by Papanek, but to others it felt like the beginning of a new phase in design, ready to replace the functionalism of the Modern Movement.[81]

Although one conference does not make a movement, the fact that the 'Design for Need' conference took place in the form it did shows that there was widespread support for a more socially responsible approach to design and this was reflected to a certain extent in mainstream publications and organizations at the time.[82] In retrospect, however, this appears to have been the highpoint of the 'Design for Need' movement. What happened after this is difficult to assess. The late 1970s and early 1980s were a complex transitional period. In architecture and design, postmodernism, rather than 'Design for Need', emerged in the late 1970s as the new phase beyond modernism; there has been little real research into the relations between ecological design and postmodernism but generally it is felt that they are antithetical.[83] There were also changes taking place

within the environmental movement too, locally and globally, which brought it more and more into the mainstream in the early 1980s as public and professional concern over the environment mounted, but paradoxically in this period design and environmentalism tended to diverge rather than converge. All of this took place in the context of changing social and political values reflected in, and created by, Thatcherism and Reaganism and their influence. Perhaps one way of measuring the changes from the late 1970s to the early 1980s is to compare the 'Design for Need' conference with the 'Design Policy' conference in 1982 again held at the Royal College of Art and organized jointly by its Department of Design Research, the Design Council, and the Design Research Society.

The papers from this conference were published in full by the Design Council in six volumes in 1984 corresponding to the subthemes of the conference: Design and Industry; Design Theory and Practice; Evaluation; Design Education; Design and Information Technology; and Design and Society. This reflected the pluralist policy of the Design Research Society which, although it tended to define design as 'planning ahead and structuring', was 'open' to all shades of opinion.[84] In the conference this could mean quite open contradiction. For example, in the printed programme a foreword by Mrs Thatcher was followed by a statement on the North–South divide by Shridath Ramphal.

The section of the conference called 'Design and Society' came closest to 'Design for Need' of 1976. Here, as elsewhere in the conference, there was discussion of the 'paradigm shift' felt to be taking place in design as it became more 'holistic', a word used to indicate the integrating, all-encompassing character of current design research. The session was chaired by Victor Papanek who later observed that much of the discussion in the conference was rather abstract and removed from the practice of design, and this seemed to bode a new 'bureaucratization' of design.[85] The 'Design and Society' section included new feminist perspectives, alongside alternative or 'socially useful' approaches to design and production, and design and developing countries. In his introduction to the book *Design and Society* Nigel Cross characterized this as part of a shift taking place from industrial to post-industrial design. He had discussed this more fully in an article in *Design*

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Studies in 1981 where he set up an alternative model based on James Robertson's concept of a SHE (Sane Humane Ecological) Future as opposed to a HE (Hyper Expansionist) future. In contrast to specialized, short-lived, mass-produced, and standardized industrial products, post-industrial products would be generalized, multi-purpose, repairable, and long-lived; the design process would be democratic and inclusive; and the designer would work in a collaborative, participatory manner. Post-industrial design would take the form of socially responsive design and eco-design.[86]

Some aspects of this model of post-industrial design continued through the 1980s: the concern with socially useful products and alternative, co-operative patterns of work, which Chris Bailey discusses in his article on the work of the British Local Authority Enterprise Boards in this issue; and eco-design which emerged as 'green design' in the mid- to late 1980s. However, the mainstream of design seemed to be moving in quite a different direction: towards a concentration on design and business in the narrower context of an industrialized market economy and 'Design for Profit'. This was the title of a government-sponsored campaign launched in 1983 following the historic seminar on 'Product Design and Market Success' held at No. 10 Downing Street in January 1982 when Mrs Thatcher met designers and entrepreneurs including Katherine Hamnett and Terence Conran. This is discussed in *Product Design and Technological Innovation*[87] as a historic turning point when design was taken seriously as a factor in industrial innovation and economic growth for the first time. This was the set book for an Open University course on 'Design and Innovation' which is a good indication of the new approach. There is an emphasis on design management, technological innovation, and economic analysis, and, despite the inclusion of Mike Cooley who discusses socially useful design and John Davis who refers to 'Appropriate Engineering', the analysis of design, technology, and innovation is mostly based on accepted notions of economic growth and confined to industrialized market economies.

When in the mid-1980s 'green design' emerged it was seen entirely within this type of business context, and had shed some of the other characteristics of Cross's 'post-industrial' paradigm. John

Elkington, in a study of environmental groups in Europe, described them as having grown out of their 'unruly teenage phase' as their cultures changed in the 1980s.[88] Whether this is what happened in the design field too is a matter of debate.

John Elkington was an environmental consultant who had long been working to improve environmental policy within industry, and who was involved in a number of new initiatives in the mid- to late 1980s concerned with the related phenomena of green design, green capitalism, and green consumerism. In 1986 he helped to organize the 'Green Designer' exhibition held in London at the Design Centre in London. It set '10 questions for the green designer' such as 'Is the product energy efficient?', 'How long will it last?', and 'Will it appeal to the green consumer?'[89] The best-selling *Green Consumer Guide* published two years later was specifically concerned with what the individual consumer could do to save the environment. John Elkington cited the example of aerosol sprays as evidence of the power of consumer pressure. In Britain, three days before Friends of the Earth was to follow up its list of 'ozone friendly' aerosols with a list of those brands containing CFCs, the eight largest aerosol manufacturers announced that they would phase out CFC propellants by the end of 1989. This indicated a quicker route to environmental change than the slow process of campaigning to change the law and government policy which would then eventually have an impact on business practice. The *Green Consumer Guide* was careful not to criticize consumerism:

The *Guide* does not promote a 'hair-shirt' lifestyle. It is designed to appeal to a 'sandals-to-Saabs' spectrum of consumers. The information provided is intended to ensure that whatever your lifestyle, you will know where to find attractive, cost-competitive products and services which are environmentally acceptable and—as far as possible—a pleasure to use.[90]

Elkington and Burke also attempted to persuade industrialists that it was in their interests to develop sound corporate environmental policies. *The Green Capitalists: How Industry Can Make Money and Protect the Environment* gave many examples of best practice and argued that this made sound economic, as well as environmental, sense. The 2nd edition of the book published in 1989 was highly enthusiastic

about the prospects for the 1990s becoming the green decade:

the evidence to date suggests that market economies can respond very rapidly indeed if the relevant environmental issues are translated into effective market signals.[91]

The book ended with a new chapter by Tom Burke, former director of Friends of the Earth, on the prospects of new age capitalism 'Into the 21st Century'.

The development of 'green design' in this period very much reflects this context, and the article in this issue by Helena Beaufoy explores some of the contradictions of green architecture and green capitalism through a case study of one of the new green building types, the 'Green Office'. Design Council initiatives in the late 1980s were concerned with persuading individual designers and companies to change their policies and practice. The 'More from Less' exhibition of November 1990, for example, provided basic 'cradle to grave' guidelines for design and covered energy, industry, buildings, domestic appliances, packaging, and recycling.[92] A similar factual and informational approach was adopted by Paul Burall in his book Green Design[93] published a year later as part of a Design Council series in Issues in Design. It described itself as a 'realistic and balanced introduction' to the complex range of environmental issues confronting the green designer or manufacturer. There was an urgent need for a short, succinct summary like this at the time, but in it green design is seen largely as a technical problem, there is very little reference to aesthetic factors or to the socio-economic context of design, although the final chapter on 'Green Ethics' raise some of the difficult ethical issues facing the would-be green designer.

Dorothy Mackenzie's book Green Design: Design for the Environment[94] appeared in the same year and answered the same demand. It had the similar aim of raising awareness of environmental issues among designers and others concerned with design.[95] At the time Dorothy Mackenzie was head of the 'Brand New' Product Development division of Michael Peters, one of the first of the big design groups to 'go green' in the 1980s, and she was particularly concerned with the design implications of a new environmental ethic. The book therefore contains lavishly illustrated, specially researched case studies of green buildings, products, graphics, and textiles to give a visual idea of the new ecological design in the making.

The other book which appeared at this time with the title Green Design was subtitled A Guide to the Environmental Impact of Building Materials[96] and was more specifically concerned with architecture. It was an A–Z guide with a useful definition of 'eco-architecture', and sections on paper, furniture, and plastics. The approach was more ecological and less commercial than the books on green design and this is true of the publications on 'green architecture' as a whole. For example, The Natural House Book written by David Pearson, founder of the Ecological Design Association, was based on the German 'baubiologie' movement and discussed the links between health and indoor pollution and the Sick Building Syndrome. It gave many examples, from all round the world, of a holistic approach to eco-architecture, of the attempt to design with, rather than against, nature. Brenda and Robert Vale, who were pioneers of energy-efficient architecture in the 1970s and wrote Green Architecture in 1991, were not so much concerned with what a building looked like as with what it did to the environment.[97] They discussed 'Architecture and the Survival of the Planet' as well as the viability of Western patterns of consumerism and the need to 'green' city planning.[98] Although the issues of sustainability and consumerism were raised in the new publications on green architecture and design in the late 1980s and early 1990s, these questions were only fully debated in the environmental literature at the time. Green consumerism, for example, was both welcomed and questioned by environmentalists. FOE supported it in principle but were concerned over its misuse in practice and the inherent contradictions of a consumer-led approach to environmental change. The FOE pamphlet Beyond Green Consumerism by Sandy Irvine[99] charts the rise of green consumerism and goes on to discuss its social, economic, and ecological limits: that it still encourages consumerism; that it is unreliable because it is based on voluntary action; and that it fails to address the global imbalance of resources. There were various attempts to go 'beyond' green consumerism. Karen Christensen, for example argued that:

The real challenge is to find a way of dismantling the consumer society and replacing it with a society rich in satis-

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factions and pleasures which make shopping and material acquisitions pall by comparison.[100]

But there were other attempts to widen the scope of consumer-based pressure, to include social and ethical issues as a whole. *The Ethical Consumer* and *New Consumer* magazines appeared at this time. *New Consumer*, for example, judged a company according to a variety of criteria including equal opportunities, animal testing, political contributions, and Third World policy as well as environmental impact. This information was made available to new consumers so that they would know all about the products and services they bought: who made them, what they were made from, what was the knock-on effect of their purchase; so that the consumer could use his/her purchasing power more effectively and help to change the face of business.[101] Richard Adams, one of the founders of *New Consumer*, had this to say about design:

Design, for those involved in environmental groups, has to show that it does more than make superficial changes to products. Green consumerism provides the designer with the best lever to effect real change . . . to help industry to move from profligate to sustainable production. Designers must change consumer preferences . . . choosing not to possess must be a value for the new century and new technology has to be seen as repairable technology. Good design embodies social principles.[102]

This raises the question of the role of design in a *green* economy, which would be quite different from 'Design for Profit'. As in the 1970s one of the areas most relevant to design in the 1980s and 1990s was environmental economics. The New Economics Foundation, which emerged with the founding of The Other Economic Summit (TOES) in 1984, produced a lot of material of great relevance to design. *The Living Economy* edited by Paul Ekins,[103] which was based on the first two TOES conferences in 1984 and 1985, is probably still the best general collection of articles. It is dedicated to E. F. Schumacher and represents an updating of his *Small is Beautiful*. The subjects covered include: basic needs; the nature of work; the search for self-reliance; local economic regeneration and cooperatives; learning from the South; and industrial priorities and technological change. These papers discuss 'the economic scenario for a conserver society' and by implication what this would mean for new industries and products.

A recent study by Michael Jacobs, *The Green Economy*, spells out more clearly what this would mean for design.[104] The book is primarily concerned with an analysis of the varieties of environmental economics, and is critical of the concepts of green consumerism and green capitalism, but in the chapter on 'Environmental Efficiency, Entropy and Energy' he has some radical suggestions to make about changes in production methods and products. Products in a green, 'circular' economy would not only be long-life, quality goods but would attempt to substitute human labour (which is solar-powered) for machine production, reduce the transportation of goods by encouraging local economies, shift demand to products with lower material content and aim for long-term reduction in per capita demand.[105]

These issues are beginning to be addressed in recent research into 'environmental affirmative' design, in Life Cycle Analysis in its various forms, and analysis of the relations between innovation in new environmental products and the size of firm.[106] While the first generation of publications on green design were 'how to do it' guides, written quickly to meet the demand for basic information, the next generation of publications in the 1990s is likely to be more considered and carefully researched, more critical and synergistic, more aware of the full complexity of design and sustainable development in both the developed and developing worlds. This special issue of the *Journal of Design History* is intended as a contribution to this widening debate and therefore covers a range of approaches and issues—from appropriate technology via green architecture to issues in craft and design education. It therefore goes beyond the limitations of 'green design' as understood at the end of the 1980s, because, as I have attempted to show, if any subject needs to be seen in a broad, critical, interdisciplinary context, it is ecological design.

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Notes

1 'Ecology' is used in the title as the most widely accepted term to refer to the full range of environmental issues and ideas. Its current usage goes beyond the original scientific meaning of the term and it now stands as a metaphor for the subtle and varied

interplay between humans and their local and global environment. Thus although many books with ecology in their title are classified in libraries under science, they are often more social and cultural in nature. Other terms are used throughout the article because of their accepted historical meanings at various times. Environmentalism is widely used to refer to ecology as a socio-political movement although this has largely been replaced by 'green' in the 1980s and 1990s. There are signs that 'eco' (as in eco-auditing, eco-labelling) is beginning to take over from the ubiquitous 'green'. Technology appears in the title too because the subject of design and ecology is so closely interwoven with technology: appropriate, alternative, or innovatory. The term 'design' here does not exclude architecture or urbanism but for reasons of space they are only briefly referred to here.

2 T. O'Riordan, *Environmentalism*, Pion Ltd., 1976, p. vi. The 2nd edition published in 1981 included a post-script and updated bibliography.

3 T. O'Riordan, 'An equilibrium not of this world', *Town & Country Planning*, May 1990, pp. 154–6.

4 World Commission on Environment and Development (headed by Gro Harlem Brundtland), *Our Common Future*, Oxford University Press, 1987.

5 Such as P. Burall, *Green Design*, The Design Council, 1991; D. Mackenzie, *Green Design, Design for the Environment*, Laurence King, 1991; *More from Less*, Design Centre exhibition catalogue, 1990–1991.

6 *Our Common Future*, op. cit., p. 43.

7 See E. Möller, *Unternehmen pro Umwelt: Ansatze ganzheitlichen Denkens in Politik und Wirtschaft, Architektur, Produktentwicklung und Design*, Lexika, 1989, which includes a bibliography and addresses of organizations. This book is rather different in kind than the English equivalents referred to in note 5; Evelin Möller does look at the subject historically and sets ecological design within the political context of environmentalism. See also *Design und Okologie*, Bayerisches Staats-ministerium für Wirtschaft und Verkehr, 1990; and O. Aicher, *die welt als entwurf*, ernst & sohn, 1991.

8 There is, for example, a lot of activity in Australia both at the Centre for Design in Melbourne and the EcoDesign Foundation at the University of Sydney. The latter recently organized an exhibition and catalogue *Green Desires: Ecology, Design, Products* in October 1992.

9 'Ecologism' is a term used by A. Bramwell, *Ecology in the 20th Century: A History*, Yale University Press, 1989, to mean the full range of literary and philosophical as well as political ideas within the environmental movement.

10 John Walker generously sent me material he had collected on green design which included a detailed bibliography and the general titles alone amounted to 200 or so. For a review of some of the recent ecological literature—partly from an architectural/design perspective—see R. Ingersoll, 'Unpacking the green man's burden', *Design Book Review*, Issue 20, Spring 1991.

11 N. Myers (ed.), *The Gaia Atlas of Planet Management: For Today's Caretakers of Tomorrow's World*, Pan Books, 1985.

12 P. Nugent, 'The Inner Design', a talk given at the London Ecology Centre, February 1991.

13 J. Button, *A Dictionary of Green Ideas: Vocabulary for a Sane and Sustainable Future*, Routledge, 1988.

14 Ibid., pp. 43–4.

15 Ibid., pp. 139–42.

16 Ibid., p. 31.

17 Ibid., p. 120.

18 J. Button, *Green Pages: A Directory of Natural Products, Services, Resources and Ideas*, Macdonald & Co., 2nd edn, 1990.

19 See note 77.

20 See also the section on 'Clothes', 'Technology', 'The World' (for the Third World), 'Work and Leisure' (for green businesses and green consumerism).

21 M. Allaby, *Thinking Green: An Anthology of Essential Ecological Writing*, Barrie & Jenkins, 1989. Michael Allaby has long been involved in the environmental movement, with the Soil Association and *The Ecologist* magazine.

22 The recent book by S. Coleman & P. O'Sullivan (eds), *William Morris and* News from Nowhere: *A Vision for Our Time*, Green Books, 1990, discusses the relevance of Morris for the contemporary ecological movement. See the review by Andrew King in *Journal of Design History*, vol. 6, no. 1, 1993, pp. 62–5.

23 A. Dobson (ed.), *The Green Reader*, André Deutsch, 1991.

24 L. White, Jr., 'The historical roots of our ecological crisis' is the most influential, and widely discussed, expression of the view that the current crisis can be traced back to Western, Christian attitudes towards nature and technology. It was originally published in *Science*, vol. 155, 10 March 1967, pp. 1203–7, and is reprinted in Allaby, *Thinking Green*, op. cit. Other classic statements on the mechanistic paradigm by Fritjof Capra, and 'The arrogance of humanism' by David Ehrenfield, are reprinted in Dobson, *The Green Reader*, op. cit., pp. 40–7.

25 C. Ponting, *A Green History of the World*, Penguin Books, 1991. Ponting is a former civil servant and now writer and organic farmer, who has long been active in the green movement.

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26 I. G. Simmons, *Changing the Face of the Earth: Culture, Environment and History*, Edward Arnold, 1989. See also his *Ecology of Natural Resources*, Edward Arnold, 1987, for a good general introduction to the subject.

27 See note 9.

28 There have been some reference to this in the literature. For example, Jos Kingston in an article on nineteenth-century utopian communities, 'It's been said before—and where did that get us?' in G. Boyle & P. Harper, *Radical Technology*, Wildwood, 1976, refers to the way in which the idea of 'harmonization with nature' was used by Hans Suren to support the idea of the 'natural superiority' of the German race in his book *Man and Sunlight* of 1927 (p. 241). Brenda and Robert Vale also refer to the National Socialists' policy of supporting subsistence homesteading as a precedent for the 'green city' in *Green Architecture: Design for a Sustainable Future*, Thames & Hudson, 1991.

29 D. Pearson, *The Natural House*, Conran Octopus, 1989, p. 20. Gropius, Mies, and Le Corbusier are the 'ecological philistines' he is referring to here because of their deliberate disregard for local conditions. By contrast Frank Lloyd Wright embodied the 'deeper ecological principles of natural building' (p. 21).

30 See chapter 4 on 'Energy economics', pp. 77–82, in Bramwell, *Ecology in the 20th Century*, op. cit., for references to modernism.

31 J. McCormick, *The Global Environmental Movement: Reclaiming Paradise*, Belhaven Press, 1989. This started out as a master's dissertation supervised by Philip Lowe who, together with Jane Goyder, wrote the classic study of *Environmental Groups in Politics*, Allen & Unwin, 1983, which contains useful discussions of the episodic development of the environmental movement and the roots of environmentalism in the nineteenth century.

32 McCormick, *The Global Environmental Movement*, op. cit., p. 65.

33 Ibid., p. 199.

34 J. McCormick, *British Politics and the Environment*, Earthscan Publications Ltd., 1991.

35 O'Riordan, *Environmentalism*, op. cit., p. vi.

36 Ibid., p. v.

37 Ibid., p. 168.

38 To quote the title of a book by M. Douglas & B. Isherwood, *The World of Goods: Towards an Anthropology of Consumption*, Penguin Books, 1979.

39 *Environmentalism*, Postscript to the 2nd edition, 1981, pp. 397–8, where he is referring to G. McRobie, *Small is Possible*, Jonathan Cape, 1981. O'Riordan's main research since this time has been into environmental impact assessment but he has also written on 'The politics of sustainability' in R. K. Turner (ed.), *Sustainable Environmental Management: Principles and Practice*, Belhaven Press, 1988.

40 V. Papanek, *Design for the Real World: Human Ecology and Social Change*, New York, 1971. For the English edition published by Thames & Hudson, 1972, the subtitle was changed to Dreyfuss-like 'Making to Measure' because it was felt that people would not understand what was meant by 'ecology'. However, the paperback edition published by Paladin in 1974 used the original subtitle.

41 Meaning 'The Milieu and the Millions', Stockholm, 1970.

42 When asked about the degree to which the ideas he had expressed first in *Design for the Real World* had been accepted in various countries, Victor Papanek replied that he felt that he had had most influence in West Germany, Austria, The Netherlands, and the Nordic countries including Iceland; that his ideas had been accepted to some degree in the UK, Canada, Australia, and Japan, and rejected to some degree in the USA where he was still thought of as a 'gadfly'. He felt that most American firms were not interested in making objects but only in 'pushing money around'. In Spain, Portugal, Italy, and France he felt his approach had negligible appeal because there style was so dominant. (Interview with Victor Papanek at the Schumacher College, 13 December 1992.)

43 V. Packard, *The Waste Makers*, Longman, Green & Co., 1961. Because this book is full of quotable statements by contemporaries in the advertising and marketing fields, it has recently been used as a source in the current debate over consumerism. See, for example, A. Durning, 'Asking how much is enough' (to be published as a book in 1993), in L. R. Brown, *State of the World 1991: A Worldwatch Institute Report on Progress Toward a Sustainable Society*, Earthscan Publications Ltd., 1991, which opens with a quote from Victor Lebow in the *Journal of Retailing* in the early 1950s, culled from Packard's book. This quote is then reused by K. Christenen in 'Don't call me a green consumer' in *Resurgence*, no. 145, March/April 1991.

44 Review in *Industrial Design*, March 1972, p. 19. Papanek discusses the reception of the book himself in the preface to the 2nd revised edition in 1984. In England the book was equally controversial; it was attacked by the architectural critic Martin Pawley but welcomed by Tony Benn in his review in *Design*, no. 281, May 1972, pp. 94–5, although he too suggested that Papanek needed to explore the political implications of his approach.

45 The recent edition of the book is selling well again in England and there has recently been a Japanese

translation too. (Interview with Papanek, December 1992.)

46 See further examples in 'Notes from a journal', *Mobilia*, no. 219/220, October/November 1973.

47 See the books written with James Hennessey, *Nomadic Furniture* 2, New York, 1974, and *How Things Don't Work*, New York, 1977.

48 Letter to the author, 17 February 1993.

49 See 'The cultural object' in R. Langdon & N. Cross (eds), *Design and Society*, Design Council, 1984, and 'Who are the best designers?' ('If good design means finding working solutions to problems in the real world, then Eskimos are some of the best designers'), *Resurgence*, no. 145, March/April 1991.

50 V. Papanek, *Design for Human Scale*, Van Nostrand Reinhold Co., 1983.

51 To be published by Thames & Hudson in 1994. Extracts from this forthcoming book have been published recently in *Resurgence*; see note 49 and 'Sensing a dwelling', *Resurgence*, no. 152, May/June 1992.

52 G. Bonsiepe, 'Precariousness and ambiguity: industrial design in dependent countries', in J. Bicknell & L. McQuiston (eds), *Design for Need: The Social Contribution of Design*, Pergamon Press, 1977. 'Between Marasm and Hope' in *Industrial Design and Human Development*, Proceedings of the XI Congress and Assembly of ICSID in Mexico, October 1979. He also wrote about his work in Chile in 'Ulm in a "Peripheral" Landscape', *Design*, no. 332, August 1976.

53 G. Bonsiepe, 'Developing countries: awareness of design and the peripheral condition', in *History of Industrial Design*, Electa, 1990, vol. 3; 'Designing the future: perspectives on industrial and graphic design in Latin America', *Design Issues*, Spring 1991.

54 The main publications by G. Bonsiepe are: *Diseño Industrial, Tecnología y Dependencía*, Mexico, 1978; *A 'Tecnología' da Tecnología*, São Paolo, 1983; *Diseño de la Periferia*, Mexico, 1985. Another book is in press, *Las Siete Columnas del Diseño*, Mexico, 1993. My thanks to Gui Bonsiepe for this information and to Luis Guimarães, a Brazilian designer working on a Ph.D. at the University of Aston in Birmingham on 'Product design in the context of the social needs of the Third World', for translating some of this material and discussing it with me and for our collaborative work on the subject generally.

55 Personal communication from Bonsiepe quoted in H. Alpay Er & J. Langrish, *Industrial Design in Developing Countries: A Review of the Design Literature*, Institute of Advanced Studies, Manchester Metropolitan University, 1992.

56 Personal communication to the author, 19 February 1993.

57 G. Bonsiepe, 'North/South: environment/design', *InCa: A Publication of the San Francisco Chapter, Industrial Designers Society of America*, August 1992.

58 Alpay Er & Langrish, *Industrial Design in Developing Countries*, op. cit., p. 8. Two recent articles on design and the developing world should be mentioned here: H. Kumar Vyas, 'The designer and the socio-technology of small production', *Journal of Design History*, vol. 4, no. 3, 1991; and C. & R. Eames, 'The Eames Report' (a reprint of their report on design for the Indian government in April 1958), *Design Issues*, vol. VII, no. 2, Spring 1991.

59 This is discussed by G. Foley, *The Energy Question*, Penguin Books, 3rd edn, 1987, in chapter 12, 'Addressing the problem of woodfuel depletion', although not from a design point of view. Foley specialized in this area in the 1980s; see G. Foley & P. Moss, *Improved Cooking Stoves in Developing Countries*, Earthscan, 1983.

60 See the quote by Button (see note 17). This whole subject has been discussed by Philip Pacey in '"Anyone designing anything?" Non-professional designers and the history of design', *Journal of Design History*, vol. 5, no. 3, 1992.

61 See G. McRobie, *Small is Possible* and *Tools for Progress 1967/8: Guide to Equipment and Materials for Small Scale Development Available in the United Kingdom*, ITDG Ltd.

62 G. Hathaway, *Low-Cost Vehicles: Options for Moving People and Goods*, IT Publications, 1985.

63 J. Vogler, *Work from Waste*, IT Publications and OXFAM, 1985, p. vii.

64 E. F. Schumacher, *Small is Beautiful: A Study of Economics as if People Mattered*, Blond & Briggs Ltd., 1973.

65 Ibid., p. 48. This chapter was based on visits to Burma and India in the late 1950s and early 1960s. Schumacher was a Christian and also wrote about economics based on Christian principles, but it was 'Buddhist economics' which appealed most to a younger generation and was frequently reprinted although it was criticised for unconscious sexism.

66 Although it is true, as George Day and Simon Croxton argue in their article in this issue, that Schumacher was not primarily concerned with environmental issues, central to his argument was the need to develop a sustainable technology which would harmonize with the self-balancing system of nature, as opposed to the supertechnology of the modern world which acted like a foreign body and shows signs of being rejected. *Small is Beautiful*, op. cit., p. 122.

67 E. F. Schumacher, *Good Work*, Jonathan Cape, 1979.

Pauline Madge

68 *Small is Beautiful*, op. cit., p. 128.

69 'Toward a human-scale technology' in *Good Work*, op. cit., pp. 23–65.

70 M. Carr (ed.), *The AT Reader: Theory and Practice in Appropriate Technology*, IT Publications, 1985. An important area of this movement which is touched on in the book is women and development; see C. Dankelman & J. Davidson, *Women, Environment and the Third World: Alliance for the Future*, Earthscan, 1988, and A. Rodda, *Women and the Environment*, Zed Books Ltd., 1991.

71 P. D. Dunn, *Appropriate Technology: Technology with a Human Face*, Macmillan, 1978.

72 K. Willoughby, *Technology Choice: A Critique of the Appropriate Technology Movement*, Westview Press/IT Publications, 1990.

73 *Small is Possible* covered such areas as the Lucas Aerospace project, cooperative enterprises in Britain, and new communities in the USA.

74 He described the AT movement as 'part lay religion, part protest movement, and part economic theory' (Foreword), W. Rybczynski, *Paper Heroes: A Review of Appropriate Technology*, Anchor Books/Prism Press, 1980. Rybczynski was a Canadian architect and acknowledged the help of Martin Pawley.

75 There are definitions of these terms in Willoughby, *Technology Choice*, op. cit., chapter 7.

76 I. Illich, *Tools for Conviviality*, Calder & Boyars, 1973. This was part of a series of discussion papers originally given at the Centre for Intercultural Documentation (CIDOC) in Cuernavaca, Mexico, and intended as 'an epilogue to the industrial age'. They covered education, medicine, work, and energy. In *Energy and Equity*, Calder & Boyars, 1974, he calls for a radical limiting of traffic in order to prevent a further decline in equity, leisure, and autonomy.

77 The first *Whole Earth Catalog* was published in 1971 as (confusingly) *The Last Whole Earth Catalog* ('Last' because the research on it stopped in 1971) by Point, USA. *The (updated) Last Whole Earth Catalog* was published in 1975 by Penguin Books.

78 *Radical Technology*, Preface, p. 5. Godfrey Boyle and Peter Harper are talking of producing an updated version of the book which would be called *Eco-Technics*. This is a term coined by Godfrey Boyle at a conference on 'AT in the 80s' in 1984 when he gave a paper on 'AT is dead: long live ET!'

79 G. Boyle, D. Elliott, & R. Roy, *The Politics of Technology*, Longman/Open University Press, 1977. See also N. Cross, D. Elliott, & R. Roy, *Man-Made Futures*, Open University Press, 1974, which is another useful collection of texts on issues to do with design and alternative technology.

80 *Design For Need* includes twenty-four out of the forty-six papers which survived from the conference, and which are listed at the end of the book. There were 104 contributions to the exhibition and symposium. Some of the unpublished papers are lying in the RCA archive waiting to be catalogued.

81 P. Lloyd Jones, 'Design for need: radio talk', *Design For Need*, pp. 91–4. Tony Frye has recently described the Design for Need conference as a 'functionalist design form rally call', 'Against an essential theory of "need": some considerations for design theory', *Design Issues*, vol. VIII, no. 2, Spring 1992.

82 In Britain at this time, 1974–6, for example, *Design* magazine carried articles on general environmental issues such as industrial waste, factory farming, and energy use, and in 'Fitness for what purpose', *Design*, January 1975, Misha Black, who had the original idea for the 'Design for Need' conference, suggested that the DIA slogan 'Fitness for Purpose' should be changed to 'Fitness for Need'. In 1974 the DIA produced a BBC Open Door programme which included a long interview with Schumacher and Kit Pedler talking about the right use of the world's resources.

83 This is the view of On-Kwok Lai in 'Green design praxis', *Design Book Review*, Issue 20, Spring 1991. Evelin Möller, in *Unternehmen pro Umwelt*, op. cit., sees both postmodernism and eco-design as reactions against the failure of 'strict functionalism'. Recently there was a conference on 'Appropriate Technology in Post-Modern Times' which suggested that postmodernism could be seen as a positive step because it undermined the simplistic belief in technical progress as the solution to all problems and could lead to the promotion of diverse socially and environmentally appropriate solutions. (Alexander Wittkowsky, *GATE* (German Appropriate Technology Exchange), no. 4, 1992, p. 31.)

84 'Design policy in design studies', *Design Studies*, vol. 3, no. 3, July 1982.

85 This account is largely based on the review of the Design Policy conference by Robin Kinross in *Information Design Journal*, vol. 3, no. 2, 1982, pp. 138–41.

86 N. Cross, 'The coming of post-industrial design', *Design Studies*, vol. 2, no. 1, January 1981, pp. 6–7. The book by James Robertson referred to is *The Sane Alternative: A Choice of Futures*, James Robertson, 1978.

87 In the Introduction by Robin Roy to R. Roy & D. Wield, *Product Design and Technical Innovation*, Open University Press, 1986. The new government policy is discussed by Chris Lorenz in 'Design policy: a resurgence for UK designers' (pp. 228–32). There was a similar historic meeting between environmentalists and Mrs Thatcher at Downing Street in 1985,

but, according to Tom Burke, she quickly decided that they were a bunch of amateurs who didn't know what they wanted. So nothing came of it and it was only later on in 1988 that Mrs Thatcher underwent her green conversion (see McCormick, *British Politics and the Environment*, op. cit., p. 64).

88 J. Elkington, *The Green Wave: A Report on the 1990 Green World Survey*, Sustainability, 1990, p. 13.

89 Reprinted in J. Elkington, T. Burke, & J. Hailes, *Green Pages: The Business of Saving the World*, Routledge, 1988, in the section on Design (pp. 72–83).

90 J. Elkington & J. Hailes, *The Green Consumer Guide: From Shampoo to Champagne—High Street Shopping for a Better Environment*, Victor Gollancz Ltd., 1988.

91 J. Elkington & T. Burke, *The Green Capitalists*, Victor Gollancz, 2nd edn, 1989.

92 'More from Less' (a quote from the Brundtland Report), an exhibition sponsored by British Gas and held at the Design Centre in London, November 1990.

93 P. Burall, *Green Design*, Design Council, 1991. Paul Burall was a former Head of Campaigns and Corporate Publicity at the Design Council and was involved in the earlier green design exhibitions at the Design Centre in the 1980s.

94 D. Mackenzie, *Green Design: Design for the Environment*, Lawrence King, 1991.

95 Dorothy Mackenzie was equally concerned with persuading management to change its traditional structures and company cultures and move towards a new 'visionary management' in line with the new 'caring' consumer. See, for example, 'Towards minimal chic', *Resurgence*, no. 143, November/December 1990.

96 A. Fox & R. Murrell, *Green Design: A Guide to the Environmental Impact of Building Materials*, Architectural Design and Technology Press, 1989.

97 The Vales have recently designed a 'zero CO_2 house'; see 'A house to beat global warming', *Independent on Sunday*, 17 May 1992.

98 There is a substantial literature on the green city and sustainable urban development but I have not dealt with it here since it is covered in Jill Seddon's review article in this issue.

99 S. Irvine, *Beyond Green Consumerism*, Discussion Paper No. 1, Friends of the Earth, 1989. For an American perspective on the same subject, see C. Plant & J. Plant (eds), *Green Business: Hope or Hoax?*, Green Books, 1991.

100 'Don't call me a green consumer', *Resurgence*, 1991. Karen Christensen's book *Home Ecology*, Arlington Books, 1989, while still based on the idea of individual action, is more about alternatives to consumerism, how to live a full life without consumer goods.

101 *New Consumer*, no. 1, Autumn 1989, p. 5. *New Consumer* publications include *Shopping for a Better World*, Kogan Page, 1991; *The Global Consumer: Best Buys to Help the Third World*, Victor Gollancz, 1991; and *Changing Corporate Values*, Kogan Page, 1991.

102 Talk given at the conference on 'Green Design: Beyond the Bandwagon?', Design Museum, May 1990.

103 P. Ekins (ed.), *The Living Economy: A New Economics in the Making*, Routledge, 1986. See also the recent books by James Robertson, a founder of NEF, *Future Work: Jobs, Self-employment and Leisure after the Industrial Age*, Gower/Maurice Temple Smith, 1985, and *Future Wealth: A New Economics for the 21st Century*, Cassell, 1989.

104 M. Jacobs, *The Green Economy: Environment, Sustainable Development and the Politics of the Future*, Pluto Press, 1991.

105 Ibid., pp. 109–10.

106 In England, notably at the Institute for Advanced Studies, Manchester Metropolitan University, and the Design and Technology Unit at the Open University.